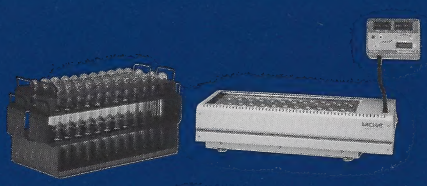
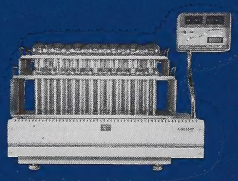
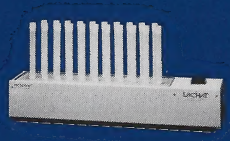
Sample Preparation Products



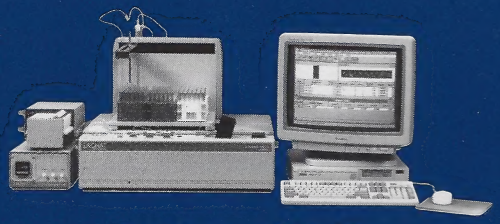
BD-46



BD-26



MICRO-DIST®



Automated In-Line

LACHAT INSTRUMENTS

BLOCK DIGESTORS

Block Digestor BD-46

Increase accuracy, precision and productivity with the BD-46 from Lachat Instruments. Developed to perform high temperature digestions to determine total Kjeldahl nitrogen and total phosphorus in environmental samples, the BD-46 brings several important innovations to the well-accepted block digestion technique including —

- **46 x 75 mL tube positions**
- **Expansion bulb built into tube design to reduce foaming**
- **Cold fingers to condense fumes**
- **Integral programmable controller for increased safety and convenience**
- **UL-listed for safety and design quality**

Maximize Accuracy and Precision

Because the BD-46 has 46 tube positions rather than the usual 40, QC samples and calibration standards can now be carried through the same digestion process as the samples. This maximizes accuracy and precision since the standards and samples are treated exactly the same.

Reduce Overflow of Samples with Surfactants

Many wastewater samples contain varying levels of surfactants which will cause foaming of the sample during digestion. The foam may then overflow from the tube onto the heated block. The special design of the BD-46 digestion tube incorporates a bulb towards the top which breaks up most foams and reduces overflow.

Increased Reliability and Viewability of Controller

The BD-46 programmable controller is attached to the block on a flexible arm which keeps it high and dry, away from spillage, and makes it easily adjustable to vary viewing angles. Other block digestors have controllers separate from the block that sit on the bench where they are liable to spillage and are difficult to view.

In the US Call 1-800-247-7613

Exclusive "Cold Finger" Fume Recovery System Eliminates the Need for Expensive Fume Scrubbers

Until the BD-46, acid fumes have presented a serious problem. Either an expensive and often ineffective acid scrubber needed to be purchased or the unit needed to be placed in a hood where corrosive fumes would attack the seals and significantly shorten the life of the hood. Now, with the addition of an inexpensive glass cold finger to each digestion tube, the acid fumes are cooled, condensed and returned to the tube where they belong. Recovery of acid fumes is nearly 100% for 2 hours of refluxing.
The following table shows complete recovery of sulfuric acid across the block.

Tube Row	% acid (v/v)	std. dev.	% RSD	% recovery
1 (front)	4.80	0.02	0.41	99.0
2	4.80	0.01	0.28	99.0
3	4.82	0.01	0.25	99.4
4 (rear)	4.79	0.01	0.25	98.8

The BD-46 system includes the effective cold finger fume recovery system at NO extra charge!

Specifications

Height x Depth x Width:	61 cm (24 in) x 35 cm (14 in) x 74 cm (29 in)
Electrical:	230 VAC, 50/60 Hz, 20A
Temperatures:	60 to 390°C (140 to 720°F)
Time Periods:	990 minutes for each of the two periods
Setpoint Accuracy:	within ±5°C of setpoint temperature
Setpoint Resolution:	10°C increments

Ordering Information

Block Digestor BD-46 for refluxing digestions: Includes 46 position heating block with integral controller, two 23 position tube racks, two 23 position cold finger racks, tube cooling rack, 48 x 75 mL refluxing tubes and 48 cold fingers	**A18206**
Metals digestion version of BD-46: Includes 46 position heating block with integral controller, two 23 position tube racks, rack stand, and 48 x 75 mL evaporator tubes	**A18207**
Refluxing tube, 75 mL: 20 & 50 mL mark, ±5%	**18088**
Evaporator tube, 75 mL: 20 & 50 mL mark (for metals digestion), ±5%	**18089**
Cold finger	**18032**

Outside the US Call 44 (0) 1279 870092

Block Digestor BD-46 *for high temperature Kjeldahl digestions of wastewaters, soils, plants, feeds, and food products*

Block Digestor BD-26 *for high temperature Kjeldahl digestions of agricultural & food products & digestions of metals prior to determination by AA or ICP*

MICRO DIST® *Micro Distillation System for rapid & precise distillations* • *Cyanide* • *Phenolics* • *Sulfides* • *Tritium* • *Ammonia*

Automated In-Line Sample Preparation • *Cyanide* • *Total Nitrogen*

Automated In-Line Sample Preparation • *Total phosphorus* • *Total phenolics* • *Surfactants*

BLOCK DIGESTORS

Block Digestor BD-26

Increase accuracy, precision and productivity with the BD-26 from Lachat Instruments. Developed to perform digestions of environmental samples prior to the determination of metals with AA or ICP, the unit was specifically designed to meet the analytical and QC protocol requirements of the USEPA's CLP Inorganics Statements of Work for determining metals in water, soil, sediment, sludge and oil. The BD-26 brings several important innovations to the well-accepted block digestion technique including —

- **High precision temperature control for all tubes**
- **26 x 250 mL tube positions**
- **Can be used for Kjeldahl, Chemical Oxygen Demand (COD), and metals digestions**
- **Cold fingers to condense fumes**
- **Tubes available in refluxing and evaporation versions**
- **Expansion bulb built into tube design to reduce foaming**
- **UL-listed for safety and design quality**

Maximize Accuracy and Precision

With the 26 tube positions provided, QC samples and calibration standards can be carried through the same digestion process as the samples. This ensures accurate monitoring of data quality in the digestion process.

Reduce Overflow of Samples with Surfactants

Many wastewater samples contain varying levels of surfactants which will cause foaming of the sample during digestion. The foam may then overflow from the tube onto the heated block. The special design of the BD-26 digestion tube incorporates a bulb towards the top which breaks up most foams and reduces overflow.

In the US Call 1-800-247-7613

Exclusive "Cold Finger" Fume Recovery System Eliminates the Need for Expensive Fume Scrubbers

Until the BD-26, acid fumes have presented a serious problem. Either an expensive and often ineffective acid scrubber needed to be purchased or the unit needed to be placed in a hood where corrosive fumes would attack the seals and significantly shorten the life of the hood. Now, with the addition of an inexpensive glass cold finger to each digestion tube, the acid fumes are cooled, condensed and returned to the tube where they belong.

Increased Reliability and Viewability of Controller

The BD-26 programmable controller is attached to the block on a flexible arm which keeps it high and dry, away from spillage, and makes it easily adjustable to vary viewing angles. Other block digestors have controllers separate from the block and sit on the bench where they are susceptible to spillage, corrosion of high power connectors, and are difficult to view.

Specifications	
Height x Depth x Width:	61 cm (24 in) x 35 cm (14 in) x 74 cm (29 in)
Electrical:	230 VAC, 50/60 Hz, 20A
Temperatures:	60 to 390°C (140 to 720°F) with 10° setting increments
Time Periods:	990 minutes for each of the two periods
Setpoint Accuracy:	within ±5°C of setpoint temperature
Setpoint Resolution:	10°C increments

Ordering Information	
Block Digestor BD-26 for refluxing digestions: Includes 26 position heating block with integral controller, two 13 position tube racks, two 13 position cold finger racks, tube cooling rack, 28 refluxing tubes, and 28 cold fingers	**A26204**
Metals digestion version of BD-26: Includes 26 position heating block with integral controller, two 13 position tube racks, rack stand, and 28 x 250 mL evaporator tubes	**A26205**
Refluxing tube, 250 mL: 100 mL mark, ±5%	**26074**
Evaporator tube, 250 mL: 100 mL mark (for metals digestion), ±5%	**26075**
Cold finger:	**26003**

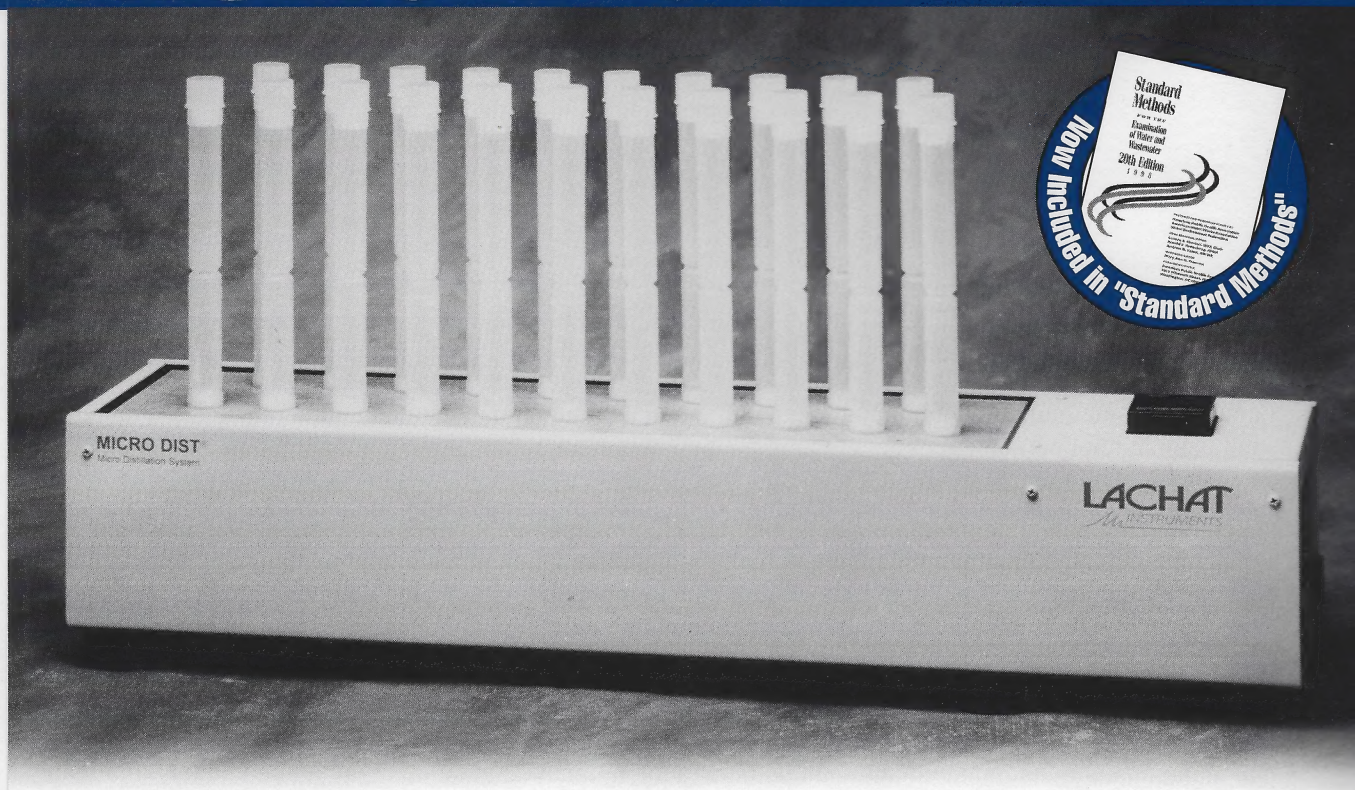
Outside the US Call 44 (0) 1279 870092

Block Digestor BD-26 *for high temperature Kjeldahl digestions of agricultural & food products & digestions of metals prior to determination by AA or ICP*

MICRO DIST® *Micro Distillation System for rapid & precise distillations* • *Cyanide* • *Phenolics* • *Sulfides* • *Tritium* • *Ammonia*

Automated In-Line Sample Preparation • *Cyanide* • *Total Nitrogen*

Automated In-Line Sample Preparation • *Total phosphorus* • *Total phenolics* • *Surfactants*



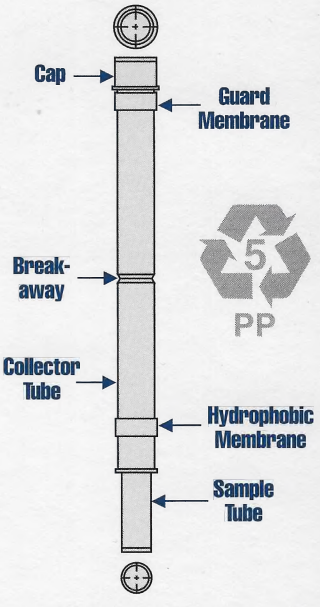
MICRO DIST® System

Rapid Distillation of Cyanides, Total Recoverable Phenolics, Sulfides, Tritium and Ammonia

With the MICRO DIST system from Lachat Instruments, you can now distill up to 21 samples for cyanides, sulfide and ammonia in 30 minutes; and phenolics and tritium in 90 minutes.

USEPA-approved QuikChem™ methods for the determination of several chemical species in environmental samples have been used for several years with the QuikChem Automated Ion Analyzer. Based on the techniques of flow injection analysis (FIA), these methods provide rapid, accurate and precise determinations. However, for some analytes samples must be taken through a complicated and time-consuming distillation process to remove the analyte from a potentially interfering matrix prior to automated analysis. As a result, the analyst is required to use a low-throughput, large-volume manual distillation method involving classical vaporization, condensation, and collection with expensive and fragile macro-scale glassware. This is incompatible with the productivity features of high-throughput automated analyzers.

In response, Lachat has developed the MICRO DIST system. This system distills 21 samples simultaneously in convenient, disposable or recyclable polypropylene tubes. The most popular applications are the distillation of cyanides and total recoverable phenolics. Both solid and liquid samples can be digested and distilled.



MICRO DIST Tube Assembly

The MICRO DIST system quantitatively scales down the sample and reagent volumes such as those required by macro-distillations in USEPA methods 335.2 for cyanides, 420.1 for phenolics and Standard Methods (20th Ed.) method 4500-CN^-N. MICRO DIST is a batch micro-distillation system which uses sample volumes of less than 10 mL. The key to the system is a disposable, distillation tube assembly (US Patents 5,022,967 and 5,304,287).

In the US Call 1-800-247-7613

The sample is dispensed into a sample tube which is then attached to a collector tube containing a hydrophobic membrane. This assembly is then inserted into a heating block where the sample is boiled. The resulting vapor passes through the membrane, condenses, and collects above the membrane in a trapping solution specific to the analyte.

Upon completion of the distillations, the collector tube is snapped in half and the distillate is brought up to volume. With MICRO DIST, the sample is distilled under conditions that are significantly more reproducible than those of a macro-distillation procedure.

Macro-distillation Glassware	MICRO DIST
There are many fragile pieces to disassemble, clean and reassemble between each distillation	The MICRO DIST tube consists of only two pieces which are disposed of after use
Leaks at glass joints are a major cause of low recoveries	The tube has one plastic press-fit joint that will never leak
The flow rate of the purge gas stream is critical	The *in situ* steam is self-purging so no external gas stream is required
Irregular contact with the heating mantle causes variable heating for each sample	The high contact block heater is temperature controlled for high precision across all samples
About 10 samples per day can be distilled in a typical lab	Over 100 samples per day can be distilled

Specifications

Height x Depth x Width	33 cm (13 in) x 17 cm (7 in) x 72 cm (28 in)
Electrical:	A17102: 110-120 VAC, 11A A17202: 220-240 VAC, 5A

Ordering Information

MICRO DIST® System:
Includes heating block, digital temperature controller, complete accessories kit, and Methods Manual

MICRO DIST tubes are available prefilled with trapping solution.
For users wishing to fill MICRO DIST tubes themselves, the User-Fill option is available.

MICRO DIST Methods No.	Matrix and Chemistry	Prefilled Pkg / 21	User-Fill Pkg / 10	User-Fill Pkg / 50	User-Fill Pkg / 100
Cyanide - 1	waters, solids, strong acid dissociable (SAD)	A17001	A17017	A17517	A17117
Cyanide - 2	caustic extracts, SAD	A17021	A17017	A17517	A17117
Cyanide - 3	waters, solids, weak acid dissociable (WAD)	A17031	A17017	A17517	A17117
Cyanide - 5	waters, SAD	A17011	A17017	A17517	A17117
Phenolics - 1	waters, solids, 4 - AATP	A17002	A17017	A17017	A17017
Sulfide - 1	waters, iodometric	A17003	A17017	A17517	A17117
Sulfide - 2	waters/MTB	A17009	A17017	A17517	A17117
Ammonia - 1	waters, phenate/ISE	Not available	A17017A	A17517A	A17117A
Ammonia - 2	waters, solids, nesslerization	Not available	A17017A	A17517A	A17117A
Tritium - 1	contaminated waters, solids	A17004	A17017	A17517	A17117

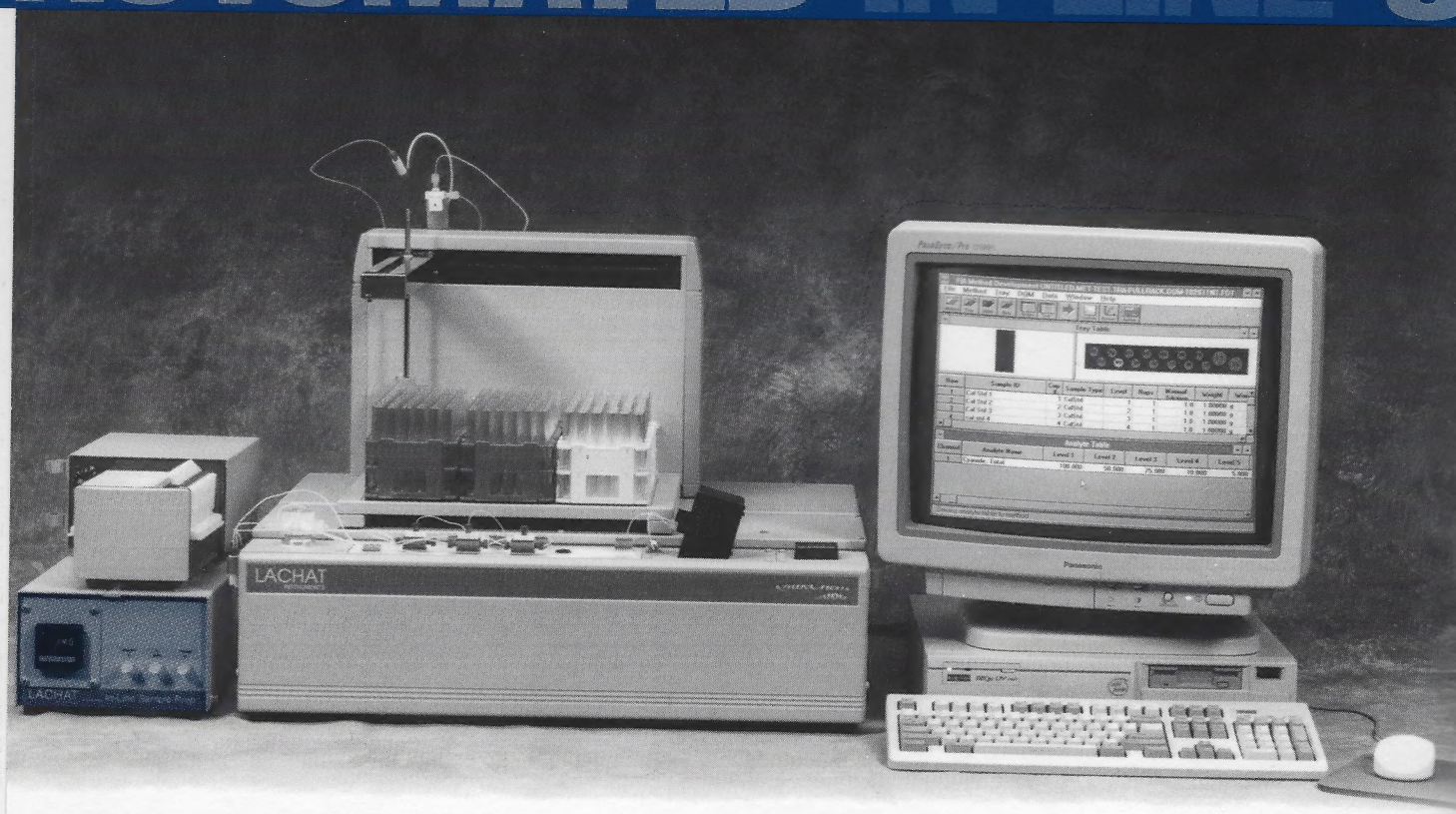
Outside the US Call 44 (0) 1279 870092

MICRO DIST® *Micro Distillation System for rapid & precise distillations* • Cyanide • Phenolics • Sulfides • Tritium • Ammonia

Automated In-Line Sample Preparation • Cyanide • Total Nitrogen

Automated In-Line Sample Preparation • Total phosphorus • Total phenolics • Surfactants

AUTOMATED IN-LINE S



Automated In-Line Sample Preparation and Analysis

Sample preparation can be a significant impediment to laboratory productivity. Even if the analysis is rapid, the need to distill, digest or extract a sample prior to analysis is extremely time-consuming. To address this issue, Lachat has developed a suite of automated in-line sample preparation and analysis modules for cyanide, total nitrogen, total phosphorus, phenolics and surfactants which can be added to QuikChem AE, 8000 or FIA+.

In-line sample preparation provides a number of benefits to the user including –

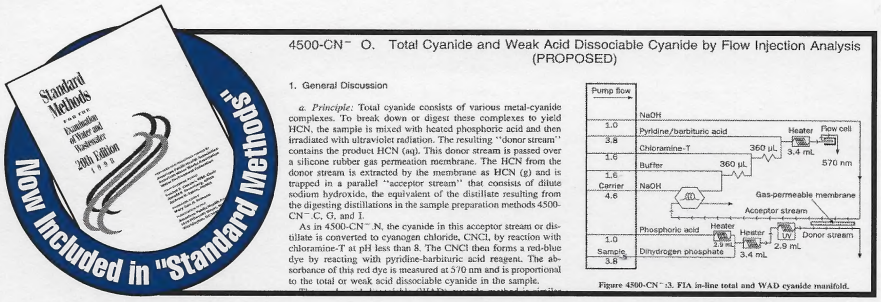
- **Automates distillations, digestions and solvent extractions**
- **Significantly improves productivity**
- **Reduces consumption of sample preparation reagents**
- **Closed preparation system reduces exposure to corrosive and toxic reagents**
- **Increases accuracy and precision with controlled system conditions**
- **Provides simple operation – just place the sample in the automatic sampler and start the run**

General Specifications	
Height x Depth x Width:	14 cm (6 in) x 54 cm (21 in) x 23 cm (9 in)
Electrical:	60Hz for 110V, 50Hz for 220V

In the US Call 1-800-247-7613

Automated In-Line *Cyanide* Sample Preparation

Using in-line cyanide distillation, a liquid sample is first mixed with preheated phosphoric acid at 143°C, and then UV-irradiated to break down metal-CN^-complexes. Using a gas diffusion membrane, the HCN(g) from the sample matrix diffuses across the membrane and is trapped in sodium hydroxide. The CN^- is then determined colorimetrically using the pyridine-barbituric acid chemistry at 570 nm. Both standards and samples are distilled in-line. The distillation and gas diffusion steps are similar to those described in ISO standard, Water Quality-Determination of total cyanide and free cyanide by flow analysis, DIS 14403 and Standard Methods (20th ed.) method 4500-CN^- O.

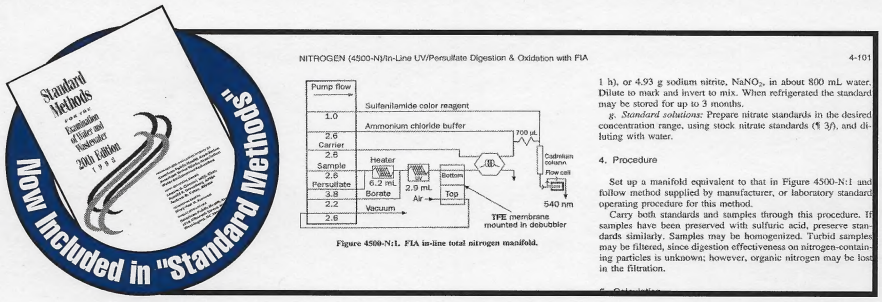

Standard Methods
Examination of Water and Wastewater
20th Edition
1998
Now Included in "Standard Methods"
4500-CN⁻ O. Total Cyanide and Weak Acid Dissociable Cyanide by Flow Injection Analysis (PROPOSED)
1. General Discussion
a. Principle: Total cyanide consists of various metal-cyanide complexes. To break down or digest these complexes to yield HCN, the sample is mixed with heated phosphoric acid and then irradiated with ultraviolet radiation. The resulting "donor stream" contains the product HCN (aq). This donor stream is passed over a silicone rubber gas permeation membrane. The HCN from the donor stream is extracted by the membrane as HCN (g) and is trapped in a parallel "acceptor stream" that consists of dilute sodium hydroxide, the equivalent of the distillate resulting from the digesting distillations in the sample preparation methods 4500-CN⁻ C, G, and I.
As in 4500-CN⁻ N, the cyanide in this acceptor stream or distillate is converted to cyanogen chloride, CNCl, by reaction with chloramine-T at pH less than 8. The CNCl then forms a red-blue dye by reacting with pyridine-barbituric acid reagent. The absorbance of this red dye is measured at 570 nm and is proportional to the total or weak acid dissociable cyanide in the sample.
Pump flow
NaOH
1.0
Pyridine/barbituric acid
3.8
Chloramine-T
1.6
Buffer
1.6
Carrier
NaOH
4.6
Phosphoric acid
1.0
Sample
3.8
Dihydrogen phosphate
Heater
Flow cell
360 µL
3.4 mL
570 nm
360 µL
Gas-permeable membrane
Acceptor stream
Heater
UV
Heater
2.9 mL
2.9 mL
Donor stream
3.4 mL
Figure 4500-CN⁻:3. FIA in-line total and WAD cyanide manifold.

Specifications

Method	Range	Matrix	MDL	%RSD
10-204-00-3-A	0.01 to 0.5 mg CN^-/L	Waters (WAD)	0.004 mg/L	1.25
10-204-00-2-C	2 to 100 µg CN/L	Waters (WAD)	0.21 µg CN/L	1.06
10-204-00-2-D	5 to 500 µg CN/L	Waters (WAD)	0.51 µg CN/L	2.05

Automated In-Line *Total Nitrogen* Sample Preparation

Nitrogen compounds are oxidized in-line to nitrate using alkaline persulfate/UV digestion. Oxidation of nitrogen containing compounds to nitrate is achieved at 90°C with additional energy supplied by UV light. The digestion occurs prior to the injection valve. After digestion nitrate is quantitatively reduced to nitrite by passage of the sample through a cadmium column. The nitrite (reduced nitrate) is then determined by diazotization with sulfanilamide under acidic conditions to form a diazomium ion. The diazonium ion is coupled with N-(1-naphthyl) ethylenediamine dihydrochloride. The resulting dye absorbs at 540 nm and is proportional to the total nitrogen concentration. This method now appears in Standard Methods (20th ed.) method 4500-N^- B.

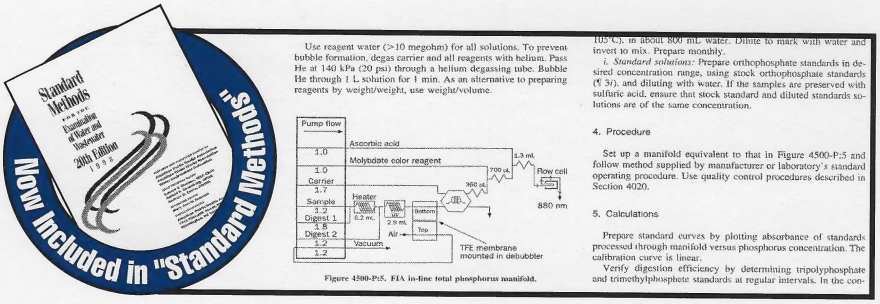

Standard Methods
Examination of Water and Wastewater
20th Edition
1998
Now Included in "Standard Methods"
NITROGEN (4500-N)/In-Line UV/Persulfate Digestion & Oxidation with FIA
4-101
Pump flow
Sulfanilamide color reagent
1.0
Ammonium chloride buffer
2.6
Carrier
2.8
Sample
2.6
Persulfate
3.8
Borate
2.2
Vacuum
2.6
Heater
6.2 mL
2.9 mL
Air
700 µL
Cadmium column
Flow cell
Bottom
Top
540 nm
TFE membrane mounted in debubbler
Figure 4500-N:1. FIA in-line total nitrogen manifold.
1 h), or 4.93 g sodium nitrite, $NaNO_2$, in about 800 mL water. Dilute to mark and invert to mix. When refrigerated the standard may be stored for up to 3 months.
g. Standard solutions: Prepare nitrate standards in the desired concentration range, using stock nitrate standards (¶ 3f), and diluting with water.
4. Procedure
Set up a manifold equivalent to that in Figure 4500-N:1 and follow method supplied by manufacturer, or laboratory standard operating procedure for this method.
Carry both standards and samples through this procedure. If samples have been preserved with sulfuric acid, preserve standards similarly. Samples may be homogenized. Turbid samples may be filtered, since digestion effectiveness on nitrogen-containing particles is unknown; however, organic nitrogen may be lost in the filtration.

Specifications

Method	Range	Matrix	MDL (mg/L)	%RSD
10-107-04-1-P	0.2 to 10 mg N/L	Waters	0.046	1.56
10-107-04-3-A	0.006 to 2 mg N/L	Waters	0.006	0.79
10-107-04-3-B	0.5 to 30 mg N/L	Waters	0.10	1.18
31-107-04-3-A	0.005 to 1 mg N/L	Brackish Waters	0.005	0.51

Automated In-Line *Total Phosphorus* Sample Preparation

The method digests various phosphorus forms and converts them to orthophosphate using persulfate with heat and an in-line UV digestion. Organic phosphorus is converted to orthophosphate by UV-catalyzed persulfate digestion. Polyphosphates are converted to orthophosphate by sulfuric acid digestion. After digestion the orthophosphate ion (PO_4^{3-}) reacts with ammonium molybdate and antimony potassium tartrate to form a phosphomolybdate complex. This complex is reduced with ascorbic acid to form a blue complex which absorbs at 880 nm. This method now appears in Standard Methods (20th ed.) 4500-P I.


Standard Methods
Examination of Water and Wastewater
20th Edition
1998
Now Included in "Standard Methods"
Use reagent water (>10 megohm) for all solutions. To prevent bubble formation, degas carrier and all reagents with helium. Pass He at 140 kPa (20 psi) through a helium degassing tube. Bubble He through 1 L solution for 1 min. As an alternative to preparing reagents by weight/weight, use weight/volume.
Pump flow
Ascorbic acid
1.0
Molybdate color reagent
1.0
Carrier
1.7
Sample
1.2
Digest 1
1.6
Digest 2
1.2
1.2
Heater
Vacuum
1.3 mL
700 µL
Flow cell
960 µL
880 nm
6.2 mL
2.9 mL
Bottom
Top
Air
TFE membrane mounted in debubbler
Figure 4500-P:5. FIA in-line total phosphorus manifold.
105°C), in about 800 mL water. Dilute to mark with water and invert to mix. Prepare monthly.
i. Standard solutions: Prepare orthophosphate standards in desired concentration range, using stock orthophosphate standards (¶ 3i), and diluting with water. If the samples are preserved with sulfuric acid, ensure that stock standard and diluted standards solutions are of the same concentration.
4. Procedure
Set up a manifold equivalent to that in Figure 4500-P:5 and follow method supplied by manufacturer or laboratory's standard operating procedure. Use quality control procedures described in Section 4020.
5. Calculations
Prepare standard curves by plotting absorbance of standards processed through manifold versus phosphorus concentration. The calibration curve is linear.
Verify digestion efficiency by determining tripolyphosphate and trimethylphosphate standards at regular intervals. In the con-

Specifications

Method	Range	Matrix	MDL (mg/L)	%RSD
10-115-01-3-A	0.1 to 10 mg P/L	Waters	0.007	0.8
10-115-01-3-B	0.025 to 4 mg P/L	Waters	0.01	0.54
10-115-01-3-C	0.01 to 1 mg P/L	Waters	0.001	0.49
10-115-01-3-D	0.005 to 1 mg P/L (AE)	Waters	0.003	0.64
31-115-01-3-D	0.05 to 1 mg P/L	Brackish Waters	0.002	0.56

Automated In-Line *Total Recoverable Phenolics in Water* Sample Preparation

Phenols in waters are extracted and preconcentrated in-line, using a small, low-pressure cartridge (4.6 x 10mm) packed with a non polar polymeric stationary phase. The retained phenol is then eluted off with 15% acetonitrile, injected onto an FIA manifold and determined using the standard 4- aminoantipyrene method.

Specifications

Method	Range	Matrix	MDL (mg/L)	%RSD
10-210-00-2-A	0.01 to 1 mg phenol/L	Waters	0.002	0.55

Automated *In-Line Surfactants* Sample Preparation (Dual Chloroform Extraction)

Anionic surfactants are complexed with the intensely colored methylene blue cation to form a chloroform extractable complex; the uncomplexed dye has an extremely small solubility in chloroform. The methylene blue-anionic complex is extracted into chloroform from the alkaline methylene blue solution to avoid the negative interference of proteinaceous material present in environmental samples. The chloroform phase is then back-extracted with an acidified methylene blue solution in order to remove the positive interference of those materials such as nitrate and chloride that form methylene blue complexes of low chloroform extractability. The absorbance of the final chloroform phase is measured at 650 nm.

Specifications

Method	Range	Matrix	MDL (mg/L)	%RSD
10-306-00-1-B	0.05 to 2 as SDS	Waters, Wastewaters	0.013	1.86
	0.1 to 2 as LAS		0.025	1.32

The following modules require that you already have a QuikChem AE, 8000 or FIA+ Automated Ion Analyzer in your laboratory

In-Line Cyanide Ordering Information

In-Line Sample Preparation Module:	**A30113 (110V)**
Includes UV lamp, gas-diffusion block and heater.	**A30213 (220V)**
Cyanide Manifold:	**E10-204-00-2-A**

In-Line TN/TP Ordering Information

In-Line Sample Preparation Module:	**A30111 (110V)**
Includes UV lamp, gas-diffusion block and heater.	**A30211 (220V)**
Total Phosphorus Manifold:	**E10-115-01-3-A**
Total Nitrogen Manifold:	**E10-107-04-1-P**

In-Line Phenol Ordering Information

Phenolic Manifold:	**E10-210-00-2-A**
Includes special valve.	
Sample Processing Module Frame:	**84922**
Detector Head:	**84908**
It is recommended that this manifold be mounted on a dedicated channel	

In-Line Surfactants Ordering Information

Surfactants Manifold:	**E10-306-00-1-B**

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